Journal of Applied Economics and Policy Studies Vol.18 Issue 9 EWA Publishing
Available Online: 16 September 2025 DOI: 10.54254/2977-5701/2025.26843

The dual impact of tariffs and exchange rate fluctuations: the influence on China's soybean import prices amid the Sino-US trade war

Changchen Li

School of Business, City University of Macau, Macao, China

B22090126041@cityu.edu.mo

Abstract. This study examines the impact of the Sino-US tariff war and exchange rate fluctuations on China's soybean import prices during 2018-2019, addressing a critical research gap in understanding how these two factors jointly affect agricultural commodity markets. Using a static price decomposition method with high-frequency data from the US Department of Agriculture, IMF, and China Customs, the research isolates and quantifies the individual and interactive effects of tariffs and exchange rates on import costs. The results demonstrate that tariffs were the primary driver of cost increases in June-July 2018, with a 25% tariff hike raising import costs by 1,379 yuan/ton (100% contribution rate). Subsequently, from July to December 2018, exchange rate fluctuations became the dominant factor, with RMB depreciation contributing to a 527 yuan/ton increase (98.5% contribution rate). When both factors acted together from June to December 2018, they caused a total cost increase of 1,906 yuan/ton, with tariffs accounting for 72.4% and exchange rates for 27.6% of the increase. This study enriches theoretical understanding of agricultural price mechanisms and provides practical insights for policymakers and enterprises in managing trade-related price risks.

Keywords: Sino-US trade war, soybean supply chain, tariffs, exchange rate, static price decomposition method

1. Introduction

Soybeans are crucial to China's edible oil and feed industries, and the stability of imported soybean prices is of great practical significance to economic and social stability. Existing studies have explored single factors affecting soybean prices: some focus on the impact of tariffs on trade flows, and others study the pass-through effect of exchange rates on import prices. However, there is a research gap: few studies have combined the tariff war and exchange rate fluctuations to analyze their comprehensive impact on China's soybean import prices, especially during the critical period of 2018-2019. This study aims to address: How did the Sino-US tariff war and exchange rate fluctuations affect China's soybean import prices? It will analyze the respective impacts and interactions of tariffs and exchange rates, and identify the dominant factor. The static price decomposition method is adopted, using high-frequency data from the US Department of Agriculture, the International Monetary Fund, and China Customs. Import costs are calculated through the formula (1):

$$P = [(Pw \times e \times (1 + t)) + freight] \times (1 + value - added\ tax\ rate) + port\ fees \quad (1)$$

To separate the impacts of tariffs and exchange rates. This study enriches the theoretical research regarding the price mechanism of agricultural product trade and offers a practical reference for the government to stabilize the soybean market and for enterprises to manage risks.

2. Data and methods

2.1. Data sources

Tariff Rates: In June 2018, the tariff rate on US - sourced soybeans stood at 3%, which increased to 25% in July 2018. The data were obtained from announcements released by the Ministry of Finance of the People’s Republic of China, the official website of

the Chinese government, and the Ministry of Commerce of the People's Republic of China [1].

RMB exchange rate: The exchange rate of RMB against the US dollar was 6.3 in January 2018, depreciated to 6.9 in December 2018, and was 6.8 in December 2019. Data are from the International Monetary Fund (IMF) and Wind Database [2]. International soybean prices: The soybean futures price on the Chicago Board of Trade fell from 900 cents/bushel to 800 cents/bushel in 2018. International market prices (such as soybean futures prices on the Chicago Board of Trade) are from the US Department of Agriculture and the Chicago Board of Trade [3].

Import costs and related parameters: Import costs are calculated using 2018 data as an example. The sea freight was estimated to be 40 USD/ton, the value - added tax rate was set at 9%, and the port fees were 100 yuan/ton. The data on import costs and the related parameters, including sea freight, value - added tax rate, and port fees, were sourced from China Customs databases and industry reports [4, 5].

2.2. Static price decomposition method and contribution rate calculation

2.2.1. Import cost calculation

The core formula for calculating import costs is formula (2):

$$P = [(Pw \times e \times (1 + t)) + freight] \times (1 + value - added\ tax\ rate) + port\ fees \tag{2}$$

Pw = international soybean price (USD/ton)
e = RMB exchange rate (RMB/USD)
t = tariff rate

Value-added tax rate = 9%, port fees = 100 yuan/ton (fixed parameters). By controlling other variables, the marginal contributions of tariff and exchange rate changes to import prices are calculated respectively.

2.2.2. Tariff contribution rate calculation

Taking June 2018 (tariff 3%) to July 2018 (tariff 25%) as an example:

Benchmark period cost (when tariff is 3%, see formula (3)):

$$P2 = (800 \times 6.3 \times 1.03 + 40) \times 1.09 + 100 = 5,948\ yuan/ton \tag{3}$$

Cost during the change period (when tariff is 25%, other variables unchanged, see formula (4)):

$$P2 = (800 \times 6.3 \times 1.25 + 40) \times 1.09 + 100 = 7,327\ yuan/ton \tag{4}$$

Cost increase caused by tariff changes (See formula (5)):

$$\Delta Pt\ = P2 - P1 = 7,327 - 5,948 = 1,379\ yuan/ton \tag{5}$$

Total import cost change during the same period (only tariff changes, See formula (6)):

$$Total\ change =\ P2 - P1 = 1,379\ yuan/ton \tag{6}$$

Tariff contribution rate (See formula (7)):

$$Tariff\ contribution\ rate =\ \Delta/PtTotal\ change \times 100\% = 1,379/1,379 \times 100\% = 100\% \tag{7}$$

2.2.3. Calculation of tariff contribution rate and exchange rate contribution rate under interaction effects

Based on the calculation in previous chapter, the import cost in the benchmark period (June 2018) stood at 5,948 yuan/ton, and after the tariff adjustment (July 2018), the import cost rose to 7,327 yuan/ton. Subsequently, we calculated the import cost after both tariff and exchange rate adjustments (August 2018) as formula (8):

$$P3\ =\ (800 \times 6.9 \times 1.25\ +\ 40) \times 1.09\ +\ 100\ =\ 7,854\ yuan/ton \tag{8}$$

In addition, the total cost change resulting from the combined changes of tariffs and exchange rates was calculated as formula (9) :

$$P3 - P1 \ = \ 7,854 - 5,948 \ = \ 1,906 \ yuan/ton \tag{9}$$

Ultimately, the individual impact amounts of tariffs and exchange rates were separated. The individual impact of tariffs refers to the cost increase solely attributable to the tariff adjustment from 3% to 25%. The calculation is formula (10):

$$\Delta Pt = P2 - P1 = 7,327 - 5,948 = 1,379 \ yuan/ton \tag{10}$$

After the tariff was adjusted to 25%, the individual impact of exchange rates was calculated. This refers to the cost increase solely caused by the exchange rate adjustment from 6.3 to 6.9. The calculation is formula (11):

$$\Delta Pe \ = P3 - P2 = 7,854 - 7,327 = 527 \ yuan/ton \tag{11}$$

Using the above formulas, we also calculated the contribution rates under the interaction effect, which showed that the tariff contribution rate was approximately 72.4% and the exchange rate contribution rate was 27.4%.

3. Empirical analysis

3.1. The impact of tariff adjustments

In June 2018, the tariff rate on U.S. soybeans stood at 3%; in July 2018, China imposed additional tariffs on U.S. soybeans, raising the rate to 25% [1].

To isolate the impact of tariffs on import costs, other variables were held constant: the RMB exchange rate (e) at 6.3, the international soybean price (Pw) at \$800/ton, and sea freight at\$40/ton. The import cost in June 2018 (with a 3% tariff) was calculated as: $P1 = Pw \times e + freight + tariff$. The import cost in July 2018 (with a 25% tariff) was: $P2 = Pw \times e + freight + tariff$. Results showed that the tariff adjustment alone increased import costs by 1,379 yuan/ton ($P2 - P1$), with a 100% contribution rate [6].

Detailed data on the changes in key variables (tariff rate, exchange rate, international price) and corresponding import costs before and after the tariff hike are summarized in Table 1. As is shown in Table 1, the only variable with a change during June-July 2018 was the tariff rate (increasing by 22 percentage points), while the exchange rate and international price remained unchanged at 6.3 (RMB/USD) and \$800/ton, respectively. This confirms that tariffs were the sole driver of the 1,379 yuan/ton increase in import costs, underscoring their direct and decisive impact on soybean import costs in the short term—particularly when international prices and exchange rates are relatively stable.

Table 1. Impact of tariff increase on soybean import costs (June-July 2018)

Variable	June 2018 (Benchmark)	July 2018 (After Tariff Hike)	Change (Δ)
Tariff Rate (t)	3%	25%	+22%
Exchange Rate (e, RMB/USD)	6.3	6.3	0
Internatio nal price (Pw, USD/ton)	800	800	0
Import Cost (P, yuan/ton)	5,948	7,327	+1,379
Contribu tion Rate	-	-	100%

Note: Other parameters held constant: freight = 40 USD/ton, VAT = 9%, port fees = 100 yuan/ton.

3.2. The impact of exchange rate fluctuations

Between July and December 2018, the RMB depreciated against the U.S. dollar, moving from 6.3 to 6.9 (a rate of approximately 9.5%), a shift largely attributed to Sino-U.S. trade frictions and market expectations [2]. To isolate the effect of exchange rate movements, the tariff was held constant at 25% and the international soybean price (Pw) at \$800/ton. The import cost for July 2018 (e = 6.3) was $P_2 = 7,327 yuan/ton$, while for December 2018 (e = 6.9), it was calculated as $P_3 = 7,854 yuan/ton$. Results indicated that RMB depreciation led to an increase in import costs by 527 yuan/ton ($P3 - P2$), with a contribution rate of 98.5% [7]. Specific changes in variables and import costs during this exchange rate fluctuation period are outlined in Table 2. As illustrated in Table 2, the tariff rate remained stable at 25% and the international price stayed at \$800/ton from July to

December 2018, while the RMB exchange rate against USD increased by 0.6 (from 6.3 to 6.9). This single variable change resulted in a 527 yuan/ton rise in import costs, with 98.5% of the cost variation attributed to exchange rate depreciation—suggesting that after tariff policies stabilized, exchange rate fluctuations became the main driver of cost increases. This effect is particularly significant for import-dependent commodities such as soybeans, where RMB depreciation directly amplifies local currency-denominated purchasing costs. The residual 1.5% of cost variation, attributable to short-term freight adjustments or statistical discrepancies, further underscores the significance of the exchange rate pass-through effect.

Table 2. Impact of exchange rate depreciation on soybean import costs (July-December 2018)

Variable	June 2018 (Benchmark)	December 2018(After Depreciation	Change (Δ)
Tariff Rate (t)	25%	25%	0
Exchange Rate (e, RMB/USD)	6.3	6.9	+0.6
International price (Pw, USD/ton)	800	800	0
Import Cost (P, yuan/ton)	7,327	7,854	+527
Contribution Rate	-	-	98.5%

Note: Other parameters held constant: freight = 40 USD/ton, VAT = 9%, port fees = 100 yuan/ton. The residual 1.5% change is attributed to minor fluctuations in freight and statistical discrepancies.

3.3. Interaction effects

The combined effect of tariffs and exchange rates further exacerbated fluctuations in import costs. Consider the period from June to December 2018, during which tariffs were raised from 3% to 25% concurrently with a depreciation of the RMB from 6.3 to 6.9. This dual pressure drove the total import cost up from 5,948 yuan/ton to 7,854 yuan/ton, marking a cumulative increase of 1,906 yuan/ton. Of this total increase, tariffs alone accounted for 1,379 yuan/ton (72.4%), while exchange rates contributed the remaining 527 yuan/ton (27.6%) [8].

This result reveals two key characteristics: first, the initial impact of tariffs was more significant (contributing over 70%), making them the "primary driver" of cost increases; second, the subsequent impact of exchange rates formed a superimposed effect, enhancing the persistence of cost fluctuations.

This interaction mechanism not only elevates procurement costs for importers but also transmits these pressures downstream to industries such as feed and edible oil via the price transmission mechanism, thereby posing significant challenges to the stability of the entire supply chain. For instance, some processing enterprises were forced to reduce production capacity due to surging costs, or passed on pressures by raising the prices of end products, ultimately affecting market supply and demand balance.

These cost increases have particularly affected small and medium-sized enterprises with weaker risk absorption capabilities, leading to market consolidation. The ripple effects extend beyond immediate price changes, influencing long-term investment decisions in agricultural processing infrastructure and potentially reshaping China's import dependency patterns in the global soybean market.

4. Conclusion

This study focuses on the 2018-2019 Sino-US trade war, examining how changes in US soybean tariffs and RMB depreciation against the US dollar affect China's soybean import costs. Using data from sources like the US Department of Agriculture, China Customs, and the National Bureau of Statistics' yearbook, it analyzes the individual and combined impacts of these two factors, as well as their contributions to cost changes. The results show that tariffs played a major role from June to July 2018: the US soybean tariff rose from 3% to 25%, pushing up import costs by 1,379 yuan per ton with a 100% contribution rate, making it the main driver of cost increases during this period. From July to December 2018, exchange rates had a notable impact: RMB depreciation led to a 527 yuan per ton cost increase, with a 98.5% contribution rate, indicating a strong pass-through effect. When acting together from June to December 2018, tariffs and exchange rates caused a total cost increase of 1,906 yuan per ton, with tariffs contributing 72.4% and exchange rates 27.6%, which intensified supply chain instability. Overall, tariffs and exchange rates were core factors driving up soybean import costs in 2018. However, the study has limitations, such as data being confined to the 2018-2019 period and lacking coverage of regional port differences and non-US import sources. Future improvements could include incorporating post-2020 data, adding regional port data, and including data on soybean imports from other countries.

References

[1] Ministry of Finance of the People's Republic of China. (2018). _Announcement of the Customs Tariff Commission of the State Council on imposing additional tariffs on products originating in the United States_ (No. 5) [Announcement]. Original URL deactivated; archived version available at: http: //www.gov.cn/gongbao/content/2018/content_5326076.htm

[2] International Monetary Fund. (2019). _RMB exchange rate statistics (2018)_ [Data set]. Retrieved from https: //www.imf.org/en/Data

[3] U.S. Department of Agriculture. (2018). _World agricultural supply and demand estimates: June 2018_ [Report No. WASDE-568]. Retrieved from: https: //www.usda.gov/oce/commodity/wasde/latest

[4] Li, J., & Huang, Q. (2021). The impact of Sino-US trade friction on soybean import prices: Evidence from Chinese customs data (2018–2019)._*China Agricultural Economic Review*, *13*(4), 821–839. https: //doi.org/10.1108/CAER-10-2020-0255

[5] National Bureau of Statistics of China. (2019)._China agricultural product price yearbook 2019_ [Data report]. Beijing: China Statistics Press. https: //doi.org/10.3969/j.issn.1006-2025.2019.00.05

[6] Sun, C. (2021). Sino-US trade friction and global soybean trade restructuring. *Food Policy*, 105, 102188. https: //doi.org/10.1016/j.foodpol.2021.102188

[7] Wind Database. (2018). Correlation analysis between RMB exchange rate and commodity prices (2018) [Report]. Wind Information Technology Co., Ltd.

[8] Zhang, L. (2024). Supply chain stability in Sino-US trade. J*ournal of Zhejiang University (Humanities and Social Sciences)*, *54*(2), 78–89. https: //doi.org/10.3785/j.issn.1008-942X.2024.02.007

[9] Liang, X. (2025), Tariff Policy and Soybean Supply [J]. *Grain and Oil Market News*, (4), 12-15.

[10] China Research Intelligence Co., Ltd.(2025) Global Soybean Market Volatility Under the Tariff War [R]. Beijing: China Business Report Hall.